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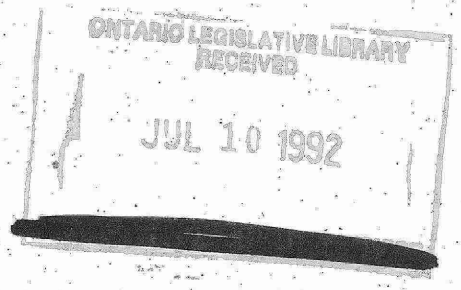
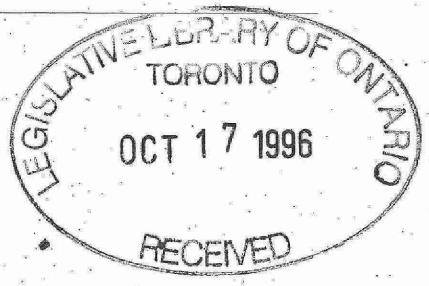
ENVIRONMENTAL RESEARCH & TECHNOLOGY



Partnerships for a Cleaner Environment

The Environmental Technologies Program



Ontario Environment Environnement

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THE ENVIRONMENTAL TECHNOLOGIES PROGRAM

One of the most important tasks in this decade is finding new ways to protect and improve our environment. It's a task that will take time, imagination, painstaking work, cooperation - and money.

The Environmental Technologies Program (ETP) of the Ontario Ministry of the Environment provides financial assistance to help develop new technologies to overcome environmentally damaging practices. The program's focus is on the latter stages of the technology innovation process; the development, refinement and commercialization of the product or process.

Developmental projects under the ETP fall into seven categories:

- waste management
- water and sewage treatment
- 3Rs technologies
- analytical instrumentation
- tire technologies
- air pollution control
- socio-economic analysis

To be eligible for funding, recipients must operate or reside in Ontario. A wide range of organizations qualify, including; Canadian corporations, subsidiaries of foreign-owned firms, universities and municipalities.

Typical ventures eligible for funding include:

- research leading to the development of an innovative process or product
- equipment prototype development and testing
- pilot-scale equipment refinement and adaptation
- field trials and demonstration of innovative technologies to determine system performance, reliability and cost effectiveness
- initial demonstration of foreign technologies to determine their suitability to Ontario conditions

Only developmental or demonstration aspects of the technology are eligible for support. Costs associated with full-scale production and marketing are not supported. Generally, funding for a project does not exceed 50 per cent of the total cost to a maximum of $500,000 annually for up to three years.

Applications for ETP funding are considered twice a year. Submissions must include detailed technical and commercial objectives, a budget, anticipated goals and a commercialization plan. The contribution of the project to the ministry's technology and regulatory needs must be clearly defined, as must the potential value to the environment.

The review of each proposal and any subsequent recommendations for funding are based on broad selection criteria, including:

- net contribution to environmental protection
- effectiveness in addressing ministry technical, policy and regulatory requirements
- scientific and technical excellence
- degree of innovation
- commercialization potential locally and internationally
- industrial and economic benefits
- financial and management capability of the applicant

Preference is given to technologies that prevent or reduce pollution at the source, rather than at the end of the pipe or stack. Those which assist organizations to meet regulatory requirements are favoured.

This booklet lists projects that were in progress, or for which contractual agreement was met for project initiation, during the 1991/92 financial year. The organization developing the technology is listed along with the project contact person and contact details. The program project number (e.g. ET 010) is also provided.

Participation in the ETP can be a winning situation for everyone - the organizations that develop the new products and processes, the government, all those who ultimately benefit from the new technologies and, most of all, our environment.

The Environmental Technologies Program is coordinated by the Research and Technology Branch. For guidelines, application forms or further information on the program, please write or call:

Research and Technology Branch
Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario, Canada
M4V 1P5

Telephone: (416) 323-4657
Fax: (416) 323-4437

WASTE MANAGEMENT

Demonstration of Vitrokele™ Technology to Recycle Cyanides and Metals at Gold Plants

Jasmetech Metal Technologies Inc.
Dr. Denis Kidby

(519) 836-9494

67 Watson Rd. S.
Guelph, Ont.
N1H 6H8 ET 010

In this project, an economically attractive process based on Vitrokele™ technology for producing environmentally acceptable effluent from gold mills was demonstrated at Bell Creek Mine near Timmins, Ont. Vitrokele™, a family of synthetic adsorbents, capture cyanide as well as significant quantities of such heavy metals as copper from slurries and discharge solutions. The cyanide is recycled back to the primary gold leaching circuit and the metals recovered for other uses. Potentially, this technology could result in a pollution abatement process which recovers all capital expenditure and produces an ongoing operating profit.

Plasma Gasification Feasibility Study of Hospital Solid Waste PSW89-01

Resorption Canada Ltd.
Mr. George Carter

(613) 822-1842

2610 Del Zotto Ave.
R.R. #5
Gloucester, Ont.
K1G 3N3 ET 032

An investigation of the plasma gasification disposal of Hospital Solid Waste in their plasma research facility is the focus of this company's developmental work. The process operates at approximately 1200°C and produces an inert slag which may have commercial uses and a medium heating value gas which may be burned immediately or stored for later use. The plasma disposal system requires an extremely small space compared to other disposal technologies. Optimal operating parameters for the process will be determined and a full environmental analysis for organics, acid gases and trace metals in the product gas, flue gas and quencher water will be conducted, plus a full leachate analysis of the slag.

Electrolytic Recovery of Zinc from Galvanized Steel

Metal Recovery Industries Inc.
Mr. Andrew Kellner

(416) 549-9894

670 Strathearne Ave. N.
Hamilton, Ont.
L8H 7N7 ET 033

An alkaline zinc electrowinning process which can be used in conjunction with an electrochemical degalvanizing process to produce a high quality zinc product is under development in this project. Once operating parameters are optimized, a prototype zinc harvesting and purification system will be designed and constructed. This will allow test marketing of the recovered zinc. Successful development would afford the opportunity to recover much of the 700,000 kg of zinc waste now generated annually in galvanized steel remelting in Canada.

WASTE MANAGEMENT

Development of Innovative Electrochemical Membrane Technology to Permit Source Recovery and Recycling of Waste Acids and Etchants

Prosep Technologies Inc.
Mr. Michael Sheedy

(416) 831-2474

Unit 7, 817 Brock Rd. S.
Pickering, Ont.
L1W 3L9 ET 057

The objective of this project is the development of an electrochemical membrane process to recover and recycle waste acids, metal salts and etchants from the metal finishing industry. This will help to eliminate the production of hazardous metal hydroxide sludges and salts now produced during the conventional neutralization of such wastes. With the completion of laboratory work, a pilot plant has been constructed and is now operating. This will be followed by a full-scale demonstration at a secondary steel producer.

Treatment of Fluids Containing Organic Contaminants

Trojan Technologies Inc.
Dr. William Cairns

(519) 685-6660

845 Consortium Ct.
London, Ont.
N6E 2S8 ET 076

Under consideration in this project is the development of a process and hardware for the treatment of gases and liquids containing organic contaminants. The process could be used in the treatment of off gases, industrial effluents, groundwater recharge, potable water and wastewater. The process and equipment under development build upon Trojan Technologies' experience in UV reactor design for control of microbial contaminants in water and wastewater. The new process and hardware are being engineered to provide high level destruction of chemical contaminants present in the influent fluids.

Development of a Micro-computer Based Expert System for Mine/Mill Effluent Treatment Plant Design (Gold Industry Case)

Wastewater Technology Centre
Mr. Abbas Zaidi

(416) 336-4618

867 Lakeshore Rd.
P.O. Box 5050
Burlington, Ont.
L7R 4A6 ET 127

A micro-computer based system which can be used to design and tailor the most cost effective effluent treatment system for cyanide/metals/toxicity removal for any given gold mill is being formulated. It will be able to generate a comprehensive report containing all relevant information on process design and cost of the selected system. The expert system will be designed specifically for the Ontario gold mining industry, with capabilities for expansion into other industrial sectors and the rest of Canada.

WASTE MANAGEMENT

Extension and Finalization of the LANDIS Expert System

Dearborn Chemical Company Ltd.
Mr. David Young

(416) 279-2222

3451 Erindale Station Rd.
P.O. Box 3060, Station A
Mississauga, Ont.
L5T 3T5 ET 130

This study involves the extension and final development of the LANDIS (LANd DISposal) expert system based software decision tool to a form relevant to Canadian situations and suitable for distribution. LANDIS is a solid waste landfill disposal assessment system. It is designed to guide the user through a solid waste assessment process to determine the suitability of disposing a specific waste in a specific landfill site. Expert system rules control the evaluation process and incorporate the expertise necessary to render final conclusions and recommendations. LANDIS is also a useful tool for conducting "what if" hypothetical scenarios.

BEI/GM Research Project to Develop a Commercial Enzymatic Process for the Polishing/Removal of Contaminants from Wastewater on an Industrial Scale

Biotech Environmental Inc.
Mr. Brian Ablett

(416) 543-3097

12616 Credit View Rd.
R.R. #2
Brampton, Ont.
L6V 1A1 ET 155

An economical and effective wastewater treatment system for the removal of dissolved phenolic compounds from water is being evaluated in this project. The system under consideration is based on the immobilization of peroxidase enzyme on the granular bone product BIOBONE™. The peroxidase enzyme acts by polymerizing phenols to insoluble polyphenols which are trapped on the bone. Two demonstration reactors (intermediate and full-scale) based on this process are being evaluated for their effectiveness in phenol removal from wastewater at the General Motors foundry in St. Catharines, Ont.

Field-Based Pilot-Scale Remediation Trials for Industrially-Contaminated Environmentally-Hazardous Soils

Tallon Metal Technologies Inc.
Dr. Bruce Holbein

(519) 766-9160

67 Watson Rd. S.
Guelph, Ont.
N1H 6H8 ET 173

The focus of this project is the design, construction and operation of a field-based pilot scale plant to evaluate a metal extraction and recovery process based on synthetic Vitrokele™ adsorbents for the remediation of contaminated soil. These adsorbents are used in conjunction with standard mineral processing unit processes (soil washing) and proprietary hydrometallurgical processes to produce decontaminated soil for reuse, while recovering metals for use in other applications.

Biofiltration of Toxic Metals from Acid Mine Drainage Through Actinorhizal Plant Systems

LAC Minerals Ltd.
Mr. Jamie Quesnel

(705) 567-4911

6 Al Wende Ave.
P.O. Box 670
Kirkland Lake, Ont.
P2N 3K2

ET 175

The effectiveness of alders (Alnus rugosa) inoculated with the microsymbionts Frankia and mycorrhizal fungi as a biological filter for the control of acid mine drainage is being evaluated in this undertaking. The metal and water tolerant alder is proposed as an ideal species for the immobilization of toxic metal pollutants from contaminated soil. Following laboratory/greenhouse studies on metal uptake and tolerance, pilot test plots will be established at a selected site. This ecological approach could prove to be a novel strategy to revegetate sterile areas of former mine tailing ponds.

WATER AND SEWAGE TREATMENT

Modular Drinking Water Pilot Plant for the 1990's

Department of Civil Engineering
University of Waterloo
Dr. Peter Huck

(403) 492-4738

Waterloo, Ont.
N2L 3G1 ET 006

The focus of this development is the design, construction and testing of modular drinking water pilot plants for use in advanced investigations with different water types. State-of-the-art processes such as ozonation, granular activated carbon and biological treatment are included. Ultimately, a refined modular design will be developed to a state of market readiness for Canadian and offshore sales.

Development of Membrane Technology for Drinking Water Production: Treatment of Coloured Waters

Zenon Environmental Inc.
Dr. Pierre Cote

(416) 639-6320

845 Harrington Ct.
Burlington, Ont.
L7N 3P3 ET 007

The potential of nanofiltration membrane technology for the removal from water of a number of soluble organic compounds, many of which cause brown-tinted water is being evaluated. Apart from aesthetic problems, these organic substances react with chlorine during conventional disinfection processes to form such harmful products as trihalomethanes. Membrane technology would be an effective alternative to conventional treatments that are not completely effective and are either expensive, lead to undesirable by-products, or require spacious installations.

Demonstration of Expert System Software for Pollution Control Planning

Wastewater Technology Centre
Ms. Judy Czajkowski
(416) 336-4599

867 Lakeshore Rd.
P.O. Box 5050
Burlington, Ont.
L7R 4A6 ET 017A

The formulation of an integrated set of computer-based tools which will allow the systematic planning and evaluation of municipal sewage collection and treatment facilities is the objective of this project. The software will then be demonstrated in a case study at Port Colborne, Ont.

WATER AND SEWAGE TREATMENT

Further Development of the Rayox® Enhanced Oxidation Product

Solarchem Enterprises Inc.
Dr. Stephen Cater

(416) 764-9666

Unit 5, 40 West Wilmot St.
Richmond Hill, Ont.
L4B 1H8 ET 024

Removal of organic pollutants from the aquatic environment using the Rayox® enhanced oxidation technology involves using high-powered ultraviolet lamps, with oxidants, which cause the generation of reactor intermediates such as the hydroxyl radical, leading to mineralization to harmless substances. Treatment of a variety of contaminated waters have been examined, including process wastewater and groundwater. Excellent results have been obtained to date even in the most problematic process waters. Such compounds as chlorinated organics, aromatic hydrocarbons, N-Nitrosodimethylamine and pentachlorophenol can all be readily reduced to or below required discharge levels. Research and development is focussing on physical and chemical process improvements to reduce the overall costs of treating contaminated water.

Hard Metal, High Efficiency Sludge Handling Pump

Hayward Gordon Ltd.
Mr. John Hayward

(416) 677-6400

7505 Bath Rd.
Mississauga, Ont.
L4T 1L3 ET 036A

This undertaking involves the design, development and field evaluation of eleven models (horizontal, vertical dry pit and immersible configurations) of a hard metal, screw impeller centrifugal pump to be used for handling both sewage and sludge in municipal and industrial wastewater treatment plants. This may lead to development of a superior system for the transfer of heavier and grittier municipal and industrial waste sludges and contribute to the more efficient and economic operation of wastewater treatment plants.

Catalysed Reductive Degradation of Halogenated Organic Compounds

Waterloo Centre for Groundwater Research
University of Waterloo
Dr. Robert Gillham

(519) 888-4658

Waterloo, Ont.
N2L 3G1 ET 074

Halogenated organic compounds are a major threat to the water environment. A cost-effective method based on reductive dehalogenation with metal surfaces acting as a catalyst for the removal of halogenated organic compounds from water is being investigated in this project. This could be an alternative to such processes as activated carbon adsorption or aeration. Through laboratory and field testing, a system having application in such areas as remediation of existing zones of groundwater contamination and the removal of trihalomethanes from chlorinated municipal water supplies is being developed.

WATER AND SEWAGE TREATMENT

Development of Continuous Preparation of Activated Silica

National Silicates Ltd.
Mr. Stephen Gibson

(416) 255-7771

429 Kipling Ave.
Toronto, Ont.
M8V 3S7 ET 132

Under development in this project is a process for the continuous preparation of activated silica, an effective inorganic coagulant aid. Activated silica is produced through the polymerization of sodium silicate with a variety of activating agents. It has been demonstrated as an effective coagulant aid in the reduction of total phosphorus discharges from sewage treatment plants and other industrial institutions. Successful development of an on-site production process that is practical and economical would enable the manufacture of an alternative to organic polyelectrolytes for use in potable, sewage and industrial wastewater treatment.

Wastewater Aerator Prototype

Aqua Aeration Systems Inc.
Mr. Andrew Jankowski

(416) 338-9237

3221 Valmarie Ave.
Mississauga, Ont.
L5C 2A4 ET 135

The fabrication and installation at a sewage plant of a full-scale prototype aerator design consisting of a multi-bladed conical configuration enclosed in a similarly conical encasement is the focus of this venture. The aerator functions by drawing in and mixing atmospheric air from above the liquid. Its efficiency is such that it can function effectively without the need for a supplementary supply of air. When installed in existing wastewater treatment facilities, the aerator would have the capability to simultaneously increase capacity and reduce operating costs through reduced energy and maintenance requirements.

Development of Sealable-Joint Sheet Pile Cutoff Walls for Groundwater Remediation

Waterloo Centre for Groundwater Research
University of Waterloo
Dr. John Cherry

(519) 888-4516

Waterloo, Ont.
N2L 3G1 ET 143

The development and production of modified steel sheet pile sections and selection of sealants for use in construction of low permeability walls has been the objective of this project. This new sheet piling differs from conventional sheet piling in that the joints can be sealed after the wall has been driven into the ground. Leakage from contained soil has been shown to be reduced to such a low value that these sheet pile cutoff walls appear suitable for a wide variety of environmental control purposes, including as a relatively low cost containment system in "pump and treat" remediation programs at contaminated sites.

Demonstration and Full-Scale Testing of a New Thermal Chemical Reduction Process for Remediation of Hamilton Harbour Sediments

EcoLogic International Inc.
Dr. Douglas Hallet

(519) 856-9591

143 Dennis St.
Rockwood, Ont.
N0B 2K0

ET 153

This developmental work has been an examination at the laboratory and pilot scale of the effectiveness of a new thermo-chemical reduction process for the destruction of such contaminants as polyaromatic hydrocarbons, polychlorinated biphenyls and other organic compounds in harbour sediments. The technology has also been assessed at the bench scale for the destruction of such pure compounds as polychlorinated biphenyls and tri- and hexachlorobenzene. Based on such criteria as destruction efficiency, non-formation of dioxins and furans, suitability for aqueous wastes, mobility and cost, this process appears suitable for application in a wide range of organic hazardous waste problems.

Development of a Process which will Reclaim Scrap and Produce New Products for Interior and Exterior Architectural Applications

Plastiglas Industries Ltd.
Mr. Stephen Baker

(416) 428-2002

403 Clements Rd. W.
Ajax, Ont.
L1S 6N3 ET 029

Fibreglass reinforced products cannot presently be recycled. The objective of this project is the development of a new process for the recovery of fibres from fibreglass-reinforced plastic scrap and their incorporation into such new products as interior and exterior building materials, or furniture. When fully operational, the company would be able to recover much of their scrap and that from other fibreglass manufacturers diverting a significant quantity of material from landfill sites.

Development of Mercury Free Reusable Alkaline Manganese Dioxide (RAM) Consumer Batteries

Battery Technologies Inc.
Dr. Klaus Tomantschger

(416) 820-1755

2480 Dunwin Dr.
Mississauga, Ont.
L5L 1J9 ET 048

The development of mercury free RAM battery technology for use in small format consumer battery sizes (AAA, AA, C, D) is being accelerated in this project. The emphasis is on the further development and refinement of the technology to produce a rechargeable alkaline AA battery which is free of mercury, and with performance and cost comparable to existing single use alkaline batteries. Use of such batteries would greatly reduce the estimated 13 tonnes of mercury disposed of annually into the Canadian environment through the disposal of small format batteries into landfill sites and incinerators.

RMDC Roofing Shingles Recycling

Roofing Materials Disposal Company Ltd.
Mr. Keith Beare

(416) 336-7575

247 Elmhurst Cres.
Burlington, Ont.
L7L 2A5 ET 052

The objective of this project is the development of a small portable processing plant for the recycling of roofing shingle waste. Based on an auger extruder, the plant will mechanically disintegrate roofing waste and homogenize it into a bituminous raw material. The material formed, asphalt composition mix, could then be marketed as a roading material or formed into such products as paving stones. Successful introduction of this technology could divert as much as 500,000 tonnes of waste from landfills in Canada each year.

Deinking of Wastepaper by High Pressure Steam Treatment for Paper Reuse

Stake Technology Ltd.
Dr. Ernest Yu

(416) 455-1990

2838 Highway 7
Norval, Ont.
L0P 1K0

ET 068

The feasibility of continuous steam-explosion treatment in the deinking of selected wastepapers for paper recycling is being assessed in this project. Studies at both the laboratory and pilot scale have suggested numerous technical and economic benefits compared with conventional processes. Using this technology, enhanced ink removal from paper fibres appears possible with reduced or even no use of deinking chemicals. The overall greater cleanliness of the fibres would also likely reduce the requirement for downstream cleaning after pulping. These benefits have been demonstrated for a wide range of paper types including coated magazines, office waste and old corrugated containers.

Proactive Printer's Waste Ink Recycling, Phase II & III

Proactive Recycling Inc.
Mr. Bert Wakeford

(519) 371-6511

235 10th St. W.
Owen Sound, Ont.
N4K 2R3

ET 080

This project is centred on the further development and application of a self-sufficient, mobile ink recycling unit capable of on-site filtering and processing. The compact prototype could be transported to the site of waste generation and produce economically viable daily quantities of recycled ink. It will be able to produce recycled ink with characteristics approaching those of virgin product and ensure full four colour recycling. This could facilitate up to 95% reduction in the amount of hazardous liquid waste ink requiring disposal.

ANALYTICAL INSTRUMENTATION

Development of a Nitrogen-Specific GC/Detector for Measurement of Atmospheric Nitrates

Unisearch Associates Inc.
Dr. John Drummond

(416) 669-3547

222 Snidercroft Rd.
Concord, Ont.
L4K 1B5

ET 066

This project involves the development, construction, testing and evaluation of a market-ready nitrogen specific gas chromatograph/detector designed for the sensitive and selective measurement of organic nitrates and mutagenic nitro-polyaromatic hydrocarbons. Applications for the instrument would include the measurement of a variety of atmospheric pollutants that are linked to oxidant formation in the atmosphere, the analysis of nitrosamines in food and the detection of explosives.

Development of Supercritical Fluid Extraction (SFE) with Ion Mobility Detector (IMD) for Qualitative Prescreening for Environmental Contaminants

Pylon Electronic Development Co. Ltd.
Dr. Frank Bales

(613) 226-7920

147 Colonnade Rd.
Nepean, Ont.
K2E 7L9

ET 094

The integration, development and testing of the technologies of Ion Mobility Detection and Supercritical Fluid Extraction to construct a self-contained, field portable and cost effective extraction instrument is the focus of this study. This tool could be used to extract, concentrate and qualitatively analyze numerous organic contaminants occurring in most environmentally sensitive effluents and other matrices.

TIRE TECHNOLOGIES

Transportable Tire Shredder

Shred-Tech Ltd.
Mr. John Bell

(519) 621-3560

201 Beverly St.
P.O. Box 1508
Cambridge, Ont.
N1R 7G8 ET 179

This venture involves the design, development, testing and demonstration of a transportable tire shredder that can be operated at remote locations and smaller landfill sites where permanent installations are not feasible. This would offer an alternative approach to shipping whole tires to central shredding sites. Capabilities of the shredder will include single person operation, extended knife life, the ability to handle both car and truck tires and the ability to ensure 2 to 4" shred size if required in order to make fuel chips for export. Following laboratory testing, the machine will be made available to various landfill sites in Ontario for practical demonstration.

Preparing of New Thermo Plastic Compounds Containing Ground Rubber Tires

Department of Chemistry
Queen's University
Dr. Warren Baker

(613) 545-2621

Kingston, Ont.
K7L 3N6 ET 226

The preparation of thermoplastic compounds containing maximum amounts of ground rubber tires that could be processed into cost effective finished products is the objective of this study. Initially, characteristics of ground rubber from different sources and processes and how their surface and bulk properties can be modified advantageously are being assessed. Accompanying this is an examination of the compounding of ground rubber with several virgin plastic polyethylene polymers. This project will provide scientific information and technical support to Ontario industries pursuing new market and new product opportunities for scrap tires.

Development of Differential Optical Absorption Spectroscopy System (DOAS) for Air Monitoring and Measurement

Unisearch Associates Inc.
Dr. Gervase Mackay

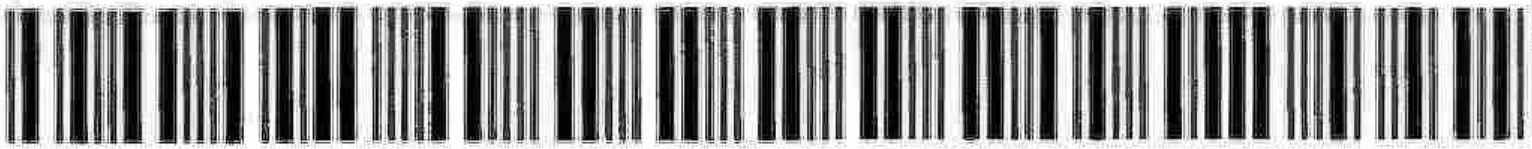
(416) 669-3547

222 Snidercroft Rd.
Concord, Ont.
L4K 1B5

ET 136

The objective of this project is the development of a commercial, mobile instrument based on differential optical absorption spectroscopy capable of measuring air pollutants automatically, simultaneously and continuously with high sensitivity and selectivity. The instrument could be used either in a remote sensing mode suitable for plume or air quality measurements or in situ measurements such as stack monitoring. It would also have application in field studies including that of oxidant chemistry to measure key atmospheric species, including a number, such as NO_3, which cannot be measured by any other method.

NOTE: There were no active projects in the socio-economic analysis category during the year.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